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(54) MECHANISMS FOR OPERATING MOVABLE BODIES

(71) We, CRAWFORD DOOR EUROPEAN COMPANY AB of 423 01 Torslanda, Sweden, a Swedish Company do hereby declare this invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to mechanisms for moving movable bodies, primarily but not exclusively for use in raising doors.

The invention seeks to provide such a mechanism, which is reliable in service, and which also makes possible the bringing of a door to a standstill, when it strikes against some obstacle as well as when due to accident the speed of movement of the reaches an abnormal level.

According to the invention, there is provided a mechanism for operating a movable body, comprising a motor, a friction clutch comprising a driving member and a driven member, first transmission means connecting the motor to said driving member, second transmission means connecting said driven member to said movable body, a braking mechanism arranged to act on said second transmission means, and means for controlling said braking mechanism including means for sensing the rate of rotation of a rotary part of said second transmission means, said sensing means being arranged to render the brake mechanism operative when the rate of rotation sensed deviates upwards or downwards from a predetermined range.

An embodiment of the invention will now be described with reference to the accompanying drawings, wherein;

Figure 1 is a schematic plan view of machinery constructed in accordance with the invention, and

Figure 2 is a schematic end view.

In the drawings, a frame is indicated at reference 1, near one end of which an adjustment bridge 2 is located which supports an electric driving motor 3 of the machinery. The adjustment bridge 2 at one of its inner end edges is pivotably journalled at the base portion of the frame 1, and at its outer edge is connected with the base portion of the frame by means of an adjustment bolt 4. On the shaft 5 of the motor a belt pulley 6 is keyed, said pulley being in driving connection via a V-belt 7 with a larger belt pulley 8, which is rotatably journalled on an intermediate shaft 9. A disc 10 is fixed to the intermediate shaft, which disc on its side facing the belt pulley 8 is provided with a suitable brake lining. The belt pulley 8 is kept pressed against the disc 10 provided with the brake lining by means of a compression spring 11 provided on the opposite side of the belt pulley, the outer end of said spring resting against a washer 12, which is kept pressed to the spring by a check nut device 13, the check nuts 13 being screwed onto the outer threaded end portion of the intermediate shaft.

The desired braking force of the clutch composed of the fixed disc 10 and the belt pulley 8, is determined by a suitable adjustment of the degree of compression of the spring 11. A spacer sleeve surrounding the intermediate shaft can be incorporated in the mechanism, the length of said sleeve being adjusted in such a manner that the spring will receive the required compression exactly when the adjustment nuts 13 are tightened in direction towards the end of the sleeve. The clutch, which is designed as a multiple disc dry clutch, the lining of which works against a steel disc, does not necessarily have to be designed according to the above description. Instead of what has been mentioned above, viz. the lining being provided on the disc 10, it can of course be provided on the belt pulley 8 if desired. The intermediate shaft is supported in bearings 14 mounted on the frame, both said bearings being located at the same side of the belt pulley 8.

A device 15 controlling the number of revolutions of the motor 3 is designed to be an electric switch, which is arranged in such a manner that the switch is kept closed at the number of revolutions which corresponds to a normal speed of movement of the door. A

magnetic brake 16 works on the intermediate shaft 9, the controlling magnet of said brake being connected in series with the switch constituting the controlling device 15. The magnetic brake is designed as a spring pressure brake and is arranged to operate, when the circuit through its operating magnet is opened.

A gear 17 is keyed on the intermediate shaft at its end opposing the belt pulley 8, said gear 17 being in driving connection with a gear 19 by means of a chain 18. The gear 19 is mounted on a second shaft 20, which is supported on the frame by means of two bearings 21. The gear 19, by means of an on-off coupling 22 designed as a claw-coupling or similar, is connected with the shaft 20, a movable member of said coupling being displaceable in the longitudinal direction of the shaft 20 between its coupling position and its free position. An operating rod 23 parallel to the shafts 9 and 20 and journalled at the frame 1 is displaceable in its longitudinal direction. At one of its ends the operating rod 23 supports an operating arm 24, which engages the movable member of the coupling 22, and is attached to the operating rod 23 by means of a check nut device 25. A pressure spring 26, surrounding the operating rod 23, has one of its ends resting against a washer 27 mounted on the operating rod, and its other end rests against the inside of one lateral portion of the frame 1. The pressure spring 26 tends to keep the operating rod 23 and consequently the coupling 22 in the position illustrated in Figure 1.

The coupling 22 can be manually released by pulling a wire 28, which is fastened in one end of a two armed operating arm 39 pivotable round a shaft 29, the other end of said shaft lying against the washer 27 of the operating rod 23. When the wire 28 is pulled in, the operating rod 23 is pressed against the bias of the spring 26 in the outwards direction, thereby disengaging the gear 19 from the shaft 20. In this released position the door can be manually operated, for example by means of a crank.

At the end of the shaft 20 located in the opposite direction relative to gear 19 still another gear 30 is keyed, which via a driving chain 31 is in connection with the door. A gear 32 is located behind the gear 30, said gear 32 by means of a chain 33 being in connection with a gear 34 on a threaded spindle 35, on which two stop dogs 36 are placed in spaced relationship; the dogs are displaced in the longitudinal direction of the spindle, when the latter is rotating. A limit switch 37 cooperates with the dogs 36. The pitch of the spindle thread and the distance between the dogs 36 are adjusted to the gear change in question in such a way that the dogs actuate the limit switch in the upper and lower positions of the door. The transmission ratio between the door and the intermediate shaft 9 can suitably be chosen in such a manner that at the normal speed of movement of the door the intermediate shaft rotates at 330 rpm. In such a case, suitable releasing values for the brake might be 280 and 380 rpm respectively. It is also possible, in addition to the controlling device for the speed of revolution, to actuate the brake by manual operation of a push button switch or the like.

If the speed of the door during a descending movement increases on account of a mechanical fault of the door assembly, the speed of the intermediate shaft 9 will increase thereby exceeding the upper value of the revolutions per minute and causing activation of the magnetic brake. The magnetic brake is also activated, if during a descending movement the door strikes against an obstacle, and in connection therewith the clutch 8, 10 is actuated. The number of revolutions of the intermediate shaft 9 then falls below the selected lower limit value of the rpm.

A switch 38 connected in the energizing circuit of the motor 3 opens said circuit when the mechanism is disconnected to allow manual operation, i.e. when the operating arm 39 is pulled clockwise into its "off" position.

WHAT WE CLAIM IS:—

1. A mechanism for operating a movable body, comprising a motor, a friction clutch comprising a driving member and a driven member, first transmission means connecting the motor to said driving member, second transmission means connecting said driven member to said movable body, a braking mechanism arranged to act on said second transmission means, and means for controlling said braking mechanism including means for sensing the rate of rotation of a rotary part of said second transmission means, said sensing means being arranged to render the brake mechanism operative when the rate of rotation sensed deviates upwards or downwards from a predetermined range.

2. A mechanism as claimed in claim 1, in which the brake mechanism is arranged whe noperative to bring said second transmission means and the movable body operated thereby to a standstill.

3. A mechanism as claimed in claim 1 or claim 2, in which the braking mechanism includes spring means for providing the brake pressure and in which the means for controlling said brake mechanism includes an electromagnet the winding of which is connected in an exciting circuit in series with switch means arranged to be opened by said sensing means when sensing a rate of rotation outside said predetermined range.

4. A mechanism as claimed in claim 3, in which one or more limit switches are con-

nected in series with said switch means, said limit switches being arranged to be actuated at the extremities of the travel of the movable body.

5. A mechanism as claimed in claim 3 or claim 4, in which a manually operable switch is provided for closing a circuit for exciting said electromagnet.

6. A mechanism as claimed in any one of claims 1 to 5, in which said second transmission means includes a first shaft connected to said driven member of the friction clutch and arranged to be actuated by said brake mechanism, a second shaft parallel to and spaced from said first shaft, and transmission means connecting said shafts.

7. A mechanism substantially as described herein with reference to the accompanying drawings.

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1453037 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

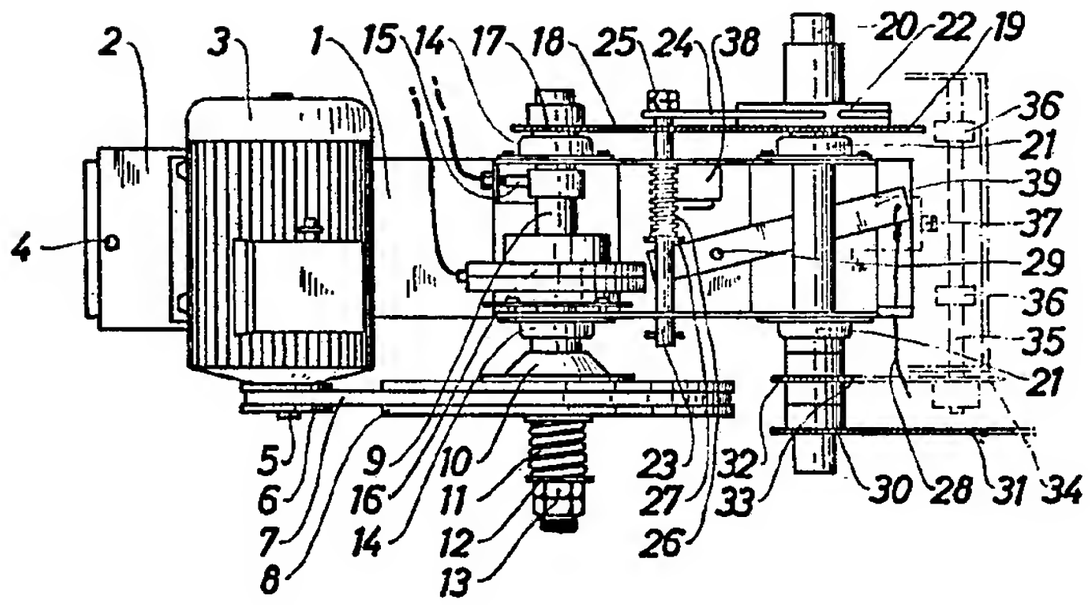

FIG. 1

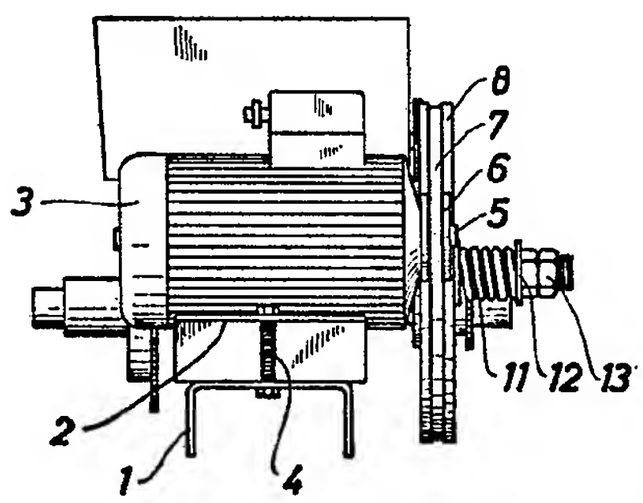

FIG. 2